Steven W. Troxler
Commissioner

North Carolina Department of Agriculture and Consumer Services

June 4, 2018

Tawanda Maignan, Team Leader
Emergency Response Team
US EPA Office of Pesticide Programs
Document Processing Desk (EMEX)
Room S4900, One Potomac Yard
2777 Crystal Drive
Arlington, VA 22202

Dear Ms. Maignan,

This letter notifies the EPA that I am requesting a Specific Exemption under Section 18 of FIFRA to allow the use of Transform WG Insecticide (EPA Reg.# 62719-625) to control tarnished plant bug in cotton grown in North Carolina. Sulfoxaflor is the active ingredient in Transform WG Insecticide. Dow AgroSciences is aware of this request and fully supports this effort.

According to Dr. Dominic Reisig, Associate Professor of Entomology at N.C. State University, the cost to control the tarnished plant bug and the crop damage due to this insect have increased steadily over the past several years. By his estimation, less than 5 percent of cotton planted in 2009 received a treatment for this pest. By 2016, the percentage of treated cotton had jumped to 75 percent, with each acre receiving at least two insecticide applications due to the tarnished plant bug. It is clear this insect has a significant impact on cotton production in North Carolina. All factors causing this increase in pest pressure are not fully understood, but resistance to the currently available pesticides is certainly a major problem. Resistance has been well documented in the Midsouth and is strongly suspected in North Carolina as well. In the Midsouth, Transform WG Insecticide plays an important role in helping to overcome this resistance, and we believe it will provide the same benefit to our cotton growers.

In order to provide North Carolina Cotton Growers the opportunity to control this devastating pest, I am requesting this emergency exemption. Should you have any questions, feel free to contact Dr. Dominic Reisig at 252-795-3764 x 133 (ddreisig@ncsu.edu), or Lee Davis of the NCDA&CS Pesticide Section at 919-857-4165 (lee.davis@ncagr.gov).

Sincerely,

Steven W. Troxler
Commissioner

cc: North Carolina Pesticide Board
Dr. Richard H. Linton, Dean, College of Agriculture and Life Sciences, NCSU
Mr. David Parrish, Chief Executive Officer, North Carolina Cotton Producers Association
Dr. Dominic Reisig, Associate Professor of Entomology, NCSU

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Emergency Exemption Request

North Carolina

Specific Exemption

For the use of Transform WG Insecticide in cotton
to control the tarnished plant bug.

EPA Reg.# 62719-625
A.I. = sulfoxaflor

This emergency exemption request is being submitted on behalf of the cotton growers in North Carolina. It is our understanding that the Mississippi Department of Agriculture has already submitted a request for this same use during the 2018 growing season. Much of the information submitted by the MDA is relevant to the situation in North Carolina and can be referenced to support this request. Information specific to North Carolina is provided in this document.

SECTION 166.20(a)(1): IDENTITY OF CONTACT PERSONS

i. Lee Davis
Pesticide Registration Manager
NCDA&CS Structural Pest Control & Pesticide Division
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ii. University Representative:
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Associate Professor of Entomology
North Carolina State University
207 Research Station Rd.
Plymouth, NC 27962
Phone: (252) 795-3764 x133
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Sites to be treated:

The insecticide will be restricted to use on cotton fields within the state of North Carolina for the purpose of controlling the tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois).

i. Method of Application:
Applications will be made by both ground and foliar application.

ii. Rate of Application:
1.5 – 2.25 oz/ac (0.047 – 0.071 lb ai/ac). Annual use will not exceed 0.266 lb ai/ac.

iii. Maximum Number of Applications:
No more than four applications per season.

iv. Total Acreage to be Treated:
Cotton acreage in North Carolina is projected to be ~500,000 acres in 2018. During 2018, North Carolina has the potential need to treat 85% (425,000) of its acreage with sulfoxaflor for control of tarnished plant bug.

Sufloxaflor may potentially be applied to cotton in the following North Carolina counties: Northampton, Hertford, Gates, Chowan, Perquimans, Pasquotank, Camden, Currituck, Halifax, Warren, Bertie, Martin, Franklin, Nash, Edgecombe, Wilson, Pitt, Beaufort, Washington, Hyde, Tyrrell, Dare, Craven, Pamlico, Carteret, Jones, Onslow, Johnston, Lee, Harnett, Cumberland, Wake, Wayne, Greene, Lenoir, Hoke, Scotland, Roberson, Moore, Richmond, Anson, Union, Stanly, Cabarrus, Davidson, Rowan, Montgomery, Cleveland, Rutherford, Lincoln, Catawba, Iredell, Sampson, Duplin, Pender, Bladen, Columbus, Brunswick.

v. Total Amount of Pesticide to be Used:

Tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois), infestations have the potential to cause economic losses on all North Carolina cotton acres, but emergency use will be restricted to 425,000 acres in in North Carolina during 2018, since infestations tend to be restricted to more northeastern counties. Therefore, up to four applications of sulfoxaflor may be required on these acres to reduce the impact of this pest. However, no more than 4 applications per growing season. There will be no more than 8.5 oz of product used per acre per season. Maximum amount of formulated product would be 28,223 gal or 113,050 lb ai.

vi. Restrictions and Requirements:

Refer to the Transform® WG container label for first aid, precautionary statements, directions for use and conditions of sale and warranty information. It is a violation of federal law to use this product in a manner that is inconsistent with all applicable label directions, restrictions and precautions found in the container label and this supplemental label. Both the container label and this supplemental section 18 quarantine exemption label must be in the possession of the user at the time of application.

Applicable restrictions and requirements concerning the proposed use and the qualifications of applicators using Transform® WG are as follows:

- Pre-harvest Interval: Do not apply within 14 d of harvest.
- Minimum Treatment Interval: Do not make applications less than 5 d apart.
- Do not make more than four applications per acre per season.
- Do not apply more than a total of 8.5 oz. of Transform WG (0.266 lb AI of sulfoxaflor) per acre per year.
- Before Transform WG can be used tarnished plant bug densities must reach or exceed thresholds published in the NC Cotton Insect Scouting Guide (equal to or greater than 15 per 100 Sweeps or 2-3 per 5 row ft on a drop cloth).

vii. Duration of the Proposed Use:

June, 2018 – October, 2018

viii. Earliest Possible Harvest Date:

October 15

SECTION 166.20(a) 4: ALTERNATIVE METHODS OF CONTROL IN NORTH CAROLINA

Insecticide Resistance: Pyrethroids

Presently, several insecticides are recommended against tarnished plant bug, but varying levels of resistance has been documented to nearly every class of these compounds among Midsouth (Arkansas, Louisiana, Mississippi, Tennessee) populations of this insect. Populations have in the Midsouth have demonstrated resistance to pyrethroids since the mid-1990's (MS Section 18 application). Even in the Midsouth, where resistance is widespread, susceptibility is variable (Parys et al. 2018, Figure 1).

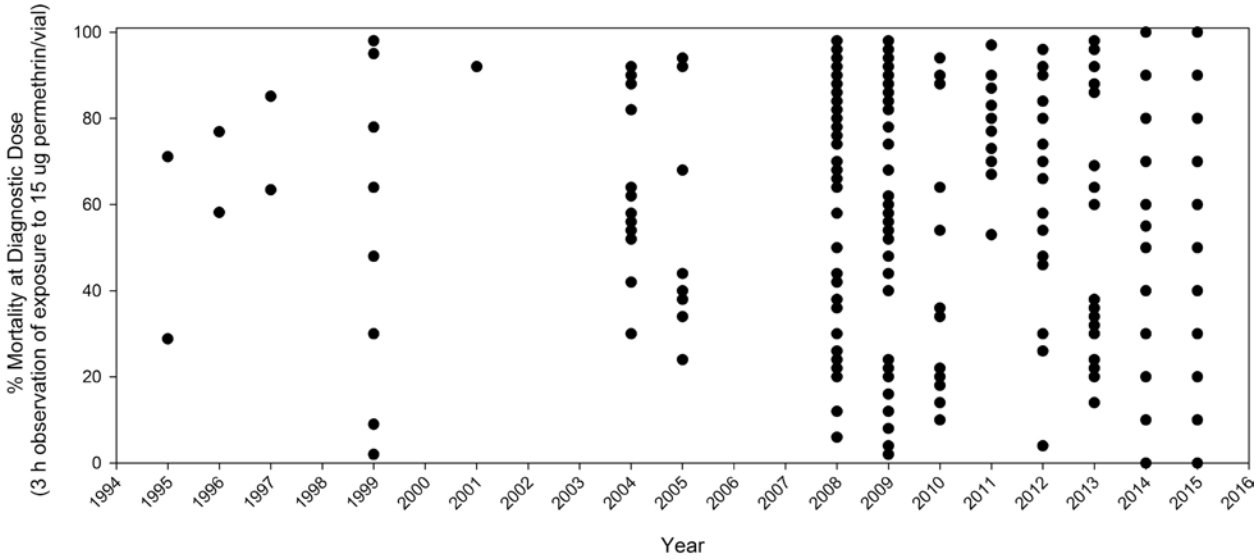

Figure 1. Figure taken from Parys et al. 2018. Individual responses of tarnished plant bug populations in the Mississippi Delta to a diagnostic dose of permethrin in a glass vial assay, 1995 through 2015.

Similar results have been experienced in North Carolina. Consultants have complained of inconsistent results using pyrethroids, which has been confirmed using a small plot trial. A 2016 trial in Plymouth, NC confirmed that the pyrethroid bifenthrin was, at least in this case, no better than the control, but could be effective when synergized with acephate (Figure 2).

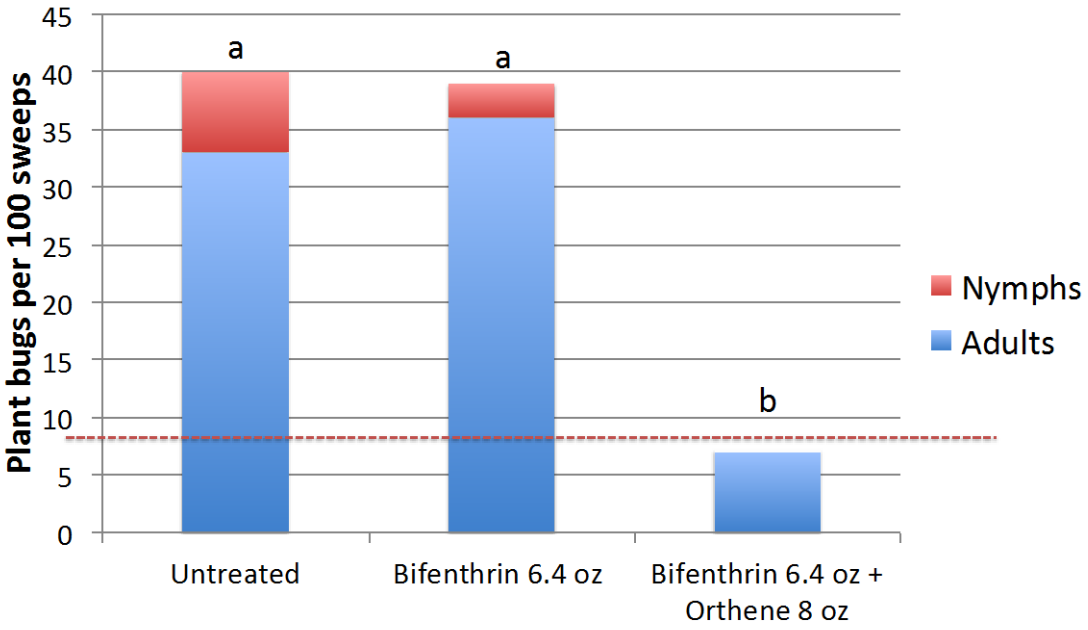

Figure 2. Tarnished plant bugs (nymphs and adults) per 100 sweeps in 2016 North Carolina small plot experiment. Red line indicates treatment threshold of 8 plant bugs per 100 sweeps. Orthene= acephate.

Further support comes from a 2018 anonymous survey of The North Carolina Agricultural Consultants Association. This organization is composed of independent (not associated with company sales) consultants who advise growers on crop-related decisions. Six consultants responded to the survey, representing 37,100 acres of cotton. All of them expected to treat tarnished plant bug during the 2018 season at least once on some of the acreage they consulted on. Most expected to some acreage treat twice for this insect, while four out of six expected to treat three times, three out of six expected to treat four times, and one out of six expected to treat some acreage five times for this insect.

All consultants, except one, suspected pyrethroid resistance for tarnished plant bug. The consultant that did not suspect pyrethroid resistance also was the only consultant who did not expect to spray multiple times for this insect and consulted on the fewest cotton acres (1,000). Four out of six consultants suspected neonicotinoid resistance, while no resistance was suspected for novaluron or organophosphates.

Consultants rated insecticides from 1 to 10, with 1 being ineffective, and 10 being total control. Average ratings were:

2.3- novaluron
3.8- neoniocotinoid
4.0- neonicotinoid + organophosphate
4.4- pyrethroid
5.3- pyrethroid + novaluron

6.1- pyrethroid + neonicotinoid
6.5- organophosphate
8.2- pyrethroid + organophosphate

Use patterns loosely followed their perceptions of control, with the following average percent use rates planned for the 2018 season:

0%- novaluron
2%- neonicotinoid + organophosphate
5.5%- pyrethroid + novaluron
5.5%- neoniocotinoid
8%- organophosphate
18%- pyrethroid
20%- pyrethroid + neonicotinoid
41%- pyrethroid + organophosphate

While the decline in efficacy of organophosphates and carbamates seen in the Midsouth (MS Section 18 application) has not been observed in North Carolina, **if pyrethroid resistance increases, growers and consultants will no doubt increase use rates of the organophosphate and carbamate classes for effective options**, which could lead to similar results in North Carolina. The need for effective insecticide classes is dire to prevent this from happening.

Neonicotinoids

The neonicotinoid class of insecticides is recommended for both tarnished plant bug and cotton aphid control in North Carolina. The insecticides in this class have historically only shown marginal control of tarnished plant bug in most cases, which is likely what was reflected in the consultant survey. Consultants rated these as low to moderately effective and suspected resistance. Thiamethoxam is by far the most active insecticide in this class. In contrast, acetamiprid is least effective in this group against tarnished plant bug.

Neonicotinoids only have a fit in the very early season (pre-flowering) in North Carolina. Efficacy tends to decline over time, with neonicotinoids performing poorly in the mid to late-season (Figure 3). Therefore, other insecticide classes are recommended for use later in the season.

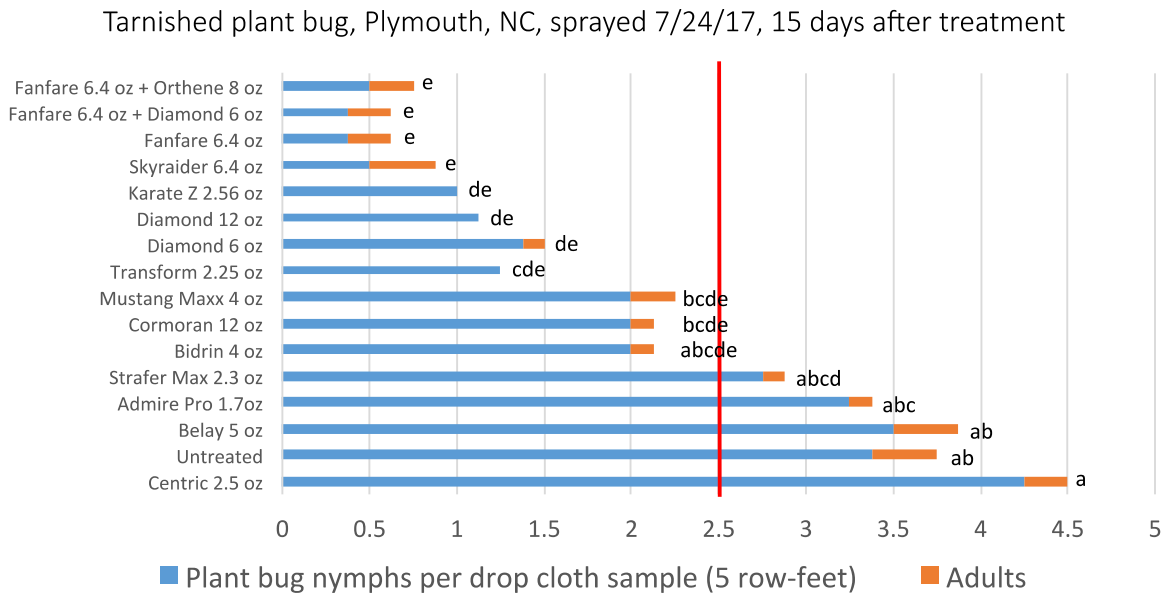

Figure 3. North Carolina small plot trial results, 2017. Red line represents treatment threshold of 2.5 tarnished plant bugs per drop cloth sample. Note that all three neonicotinoids- Admire Pro (imidacloprid), Belay (clothianidin), and Centric (thiamethoxam) performed poorly. Although Fanfare (bifenthrin) and Karate Z (lambda-cyhalothrin) were effective in this 2017 trial, bifenthrin was ineffective during 2016 (Figure 1). This highlights the inconsistency of pyrethroids, which is a feature seen when resistance is developing (Parys et al. 2018).

Others

There are currently only two other insecticide classes labeled for tarnished plant bug control. The first is flonicamid (Carbine) a pyridine caboxamide. Although this insecticide does show some activity against tarnished plant bugs and provides good control of western tarnished plant bug (*Lygus hesperus*), results have not been promising in the Midsouth (MS Section 18 application) or North Carolina. This insecticide was screened in North Carolina during 2015 and did not separate from the control, while other insecticides did (Figure 4).

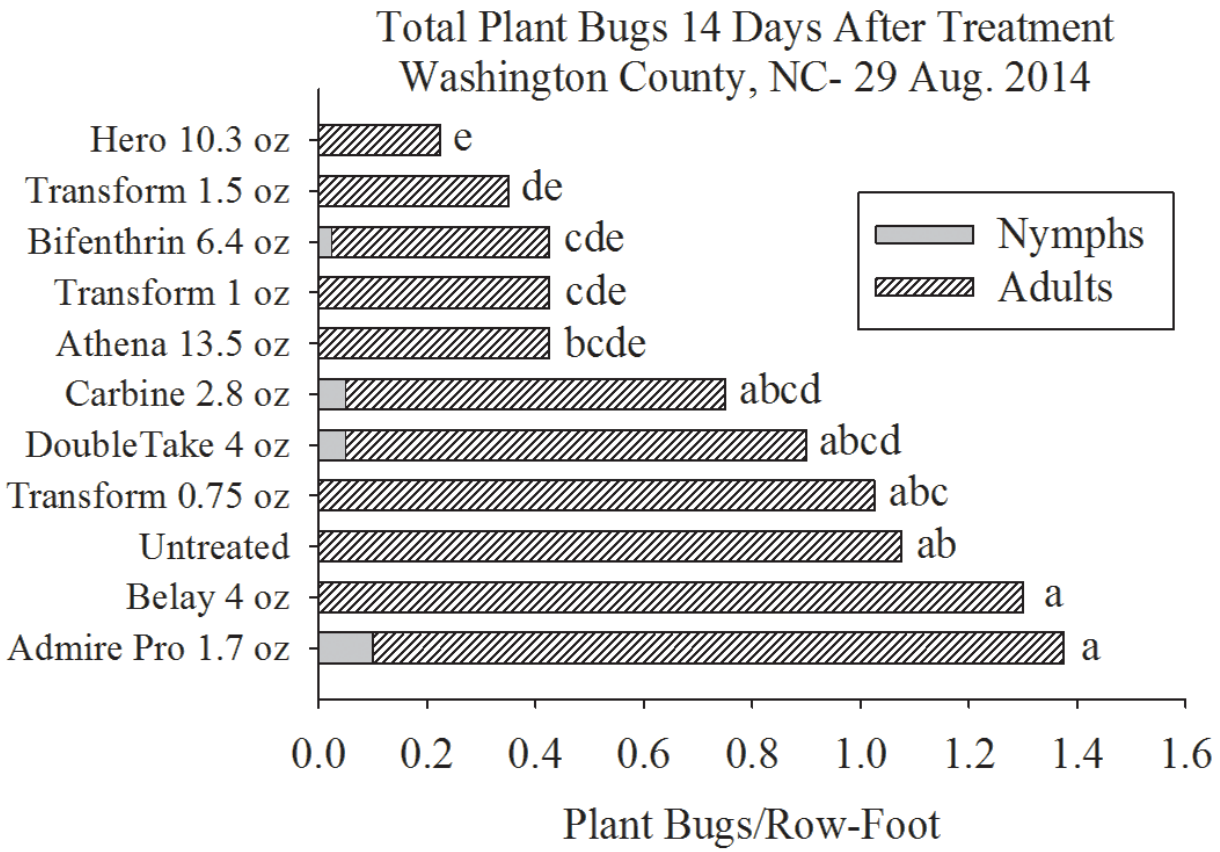

Figure 4. 2014 North Carolina small plot trial for tarnished plant bug.

The other insecticide is novaluron (Diamond), an insect growth regulator. Because novaluron is an insect growth regulator, it only controls the immature stages of tarnished plant bug and has no activity against adults. Field testing of this insecticide in the Midsouth (MS Section 18 application) and in North Carolina generally show variable results in terms of tarnished plant bug control.

Although the situation in North Carolina is not as dire as the Midsouth region, tarnished plant bug has been an an increasing problem since 2009, with North Carolina cotton producers averaging over 2 insecticide applications for this pest during 2016 (Williams 2017; Figure 5).

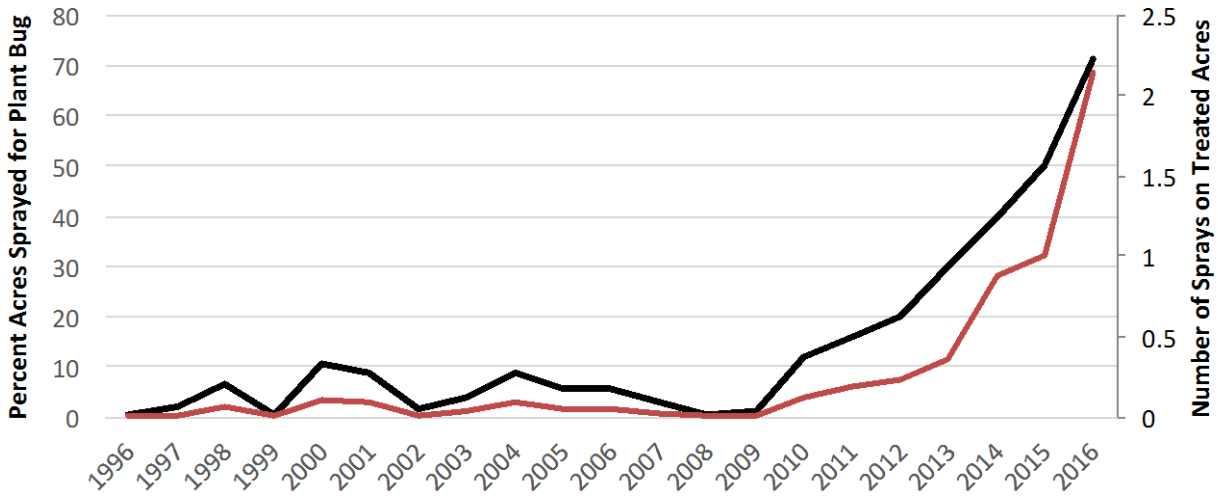

Figure 5. Percent North Carolina cotton acres sprays and number of insecticide sprays on acres treated for tarnished plant bug in North Carolina per year. Black line= percent acres sprayed; red line= mean number of sprays per acre treated. Data compiled from Cotton Insect Losses in Beltwide Proceedings.

Current trends with insecticide resistance without effective alternative technologies will allow problems with tarnished plant bug management to intensify across North Carolina. Effective tarnished plant bug control in the absence of sulfoxaflor is a serious, unmet need for North Carolina and one that requires immediate and urgent action. Due to increasing problems with pyrethroids, North Carolina growers are in an emergency situation, similar to that in the Midsouth (MS Section 18 applications). **The granting of Section 18 emergency exemption in the Midsouth region has made cotton production more sustainable and North Carolina cotton growers need access to the same suite of available insecticides**.

It has been clearly documented in the past that excessive use of non-selective and disruptive products for tarnished plant bug can induce additional pest problems (spider mites and cotton aphids) in some areas. In Mississippi there is a strong correlation between the numbers of applications targeting tarnished plant bugs and other pests such as cotton aphids and spider mites (MS Section 18 application). This is of great concern to many producers and pest management practitioners in North Carolina. Organophosphate, carbamate and pyrethroid insecticides can impact natural beneficial arthropod populations and flare secondary insects. Acephate is commonly used for tarnished plant bug control and can flare aphids and mites. Pyrethroid insecticides may flare aphids and mites, as well. Sulfoxaflor use will reduce the frequency of selected insecticides used, especially acephate, dicrotophos, and oxamyl. The ecological and toxicological profile of sulfoxaflor is considered to be more favorable than the ecological and toxicological profiles of these insecticides. Data currently suggest that sulfoxaflor will not flare aphids and mites and will be safer to pollinators than alternatives.

(*ii) A detailed explanation of why alternative practices, if available, either would not provide adequate control or would not be economically or environmentally feasible.*
Several IPM strategies are recommended for controlling tarnished plant bug in cotton (Gore et al. 2008). Non-chemical tactics include area-wide control of non-crop alternate hosts and selected

host plant resistance traits. Proper selection of varieties and managing the optimum planting period are being used to produce a rapid fruiting and early maturing crop; thereby reducing the time the crop is susceptible to this pest. Careful insecticide application timing based upon revised spray action thresholds are used to precisely target populations before they reach outbreak levels. All of these practices are currently in place and are being used by cotton producers. However, these strategies only serve to suppress populations and are not effective as stand-alone practices. Effective chemical control practices are still necessary to provide tarnished plant bug management in cotton. As highlighted above the current situation in North Carolina has produced severe economic burdens on cotton producers.

Currently, tarnished plant bugs have widespread resistance to the pyrethroids, organophosphates, and carbamates in the Midsouth (MS Section 18 application). Furthermore, it is likely that such resistance could develop in North Carolina, as well, given the similarity in insecticide efficacy and use pattern between North Carolina and the Midsouth. Predicting where the resistance levels will be highest from year to year extremely difficult. In years prior to sulfoxaflor use, field use rates have more than doubled and control continued to decline with available products in the Midsouth. This put a tremendous pressure on the neonicotinoid class. Of that class, thiamethoxam had by far been the most effective in the class for tarnished plant bug control; however there is now elevated concern due to resistance concerns in the Midsouth and declining efficacy in North Carolina (Figure 4). Consequently, two to four pre-flower applications in cotton target both tarnished plant bugs and cotton aphids. Thiamethoxam (Centric) has been the insecticide of choice in this situation because it provided better control of the whole pest complex than other neonicotinoids at that time of the year. The most common rate used at that time of year is 2 oz formulated product per acre (0.05 lbs ai/A). The maximum seasonal use rate for thiamethoxam is 5.0 oz (0.125 lb ai thiamethoxam). Therefore, two applications of Centric at 2 oz/A (0.05 lbs ai per acre per application) during the pre-flowering period does not leave enough active ingredient for later applications of either thiamethoxam + lambda-cyhalothrin (Centric or Endigo). The only other labeled insecticides available are flonicamid (Carbine) and novaluron (Diamond). Figure 3 shows the efficacy of flonicamid (Carbine). Novaluron is the only other insecticide available for late season tarnished plant bug control in North Carolina, aside from the organophosphates. As mentioned previously, novaluron is an insect growth regulator that only controls the immature stages. Therefore, novaluron applications are exclusively used with another class of chemistry to control adults. Also, application timing is critical with this insecticide and applications are often sprayed too late to provide the most effective levels of control. Therefore, the use of sulfoxaflor should provide significant economic benefits for cotton growers in North Carolina, as it has done in the Midsouth.

SECTION 166.20(a) 5: EFFECTIVENESS OF PROPOSED USE

Value of Transform in an Overall IPM Approach for Tarnished Plant Bug in Cotton

Sulfoxaflor rapidly became the foundation for the IPM approach in the Midsouth because of its high level of efficacy against tarnished plant bug and the relative safety for beneficial insects (Figure 6). Even at very high use rates (100 g ai/ha=3.0 oz/A), significantly more beneficial arthropods were conserved compared to the pyrethroid (Warrior) and the organophosphate (Orthene). Similar results were observed by Kerns et al. (2011) where densities of convergent lady

beetles for sulfoxaflor were not significantly different than flonicamid (Carbine). Both the flonicamid and sulfoxaflor had significantly lower densities than the untreated control, which was most likely due to the reduction in prey (cotton aphid) in the treated plots.

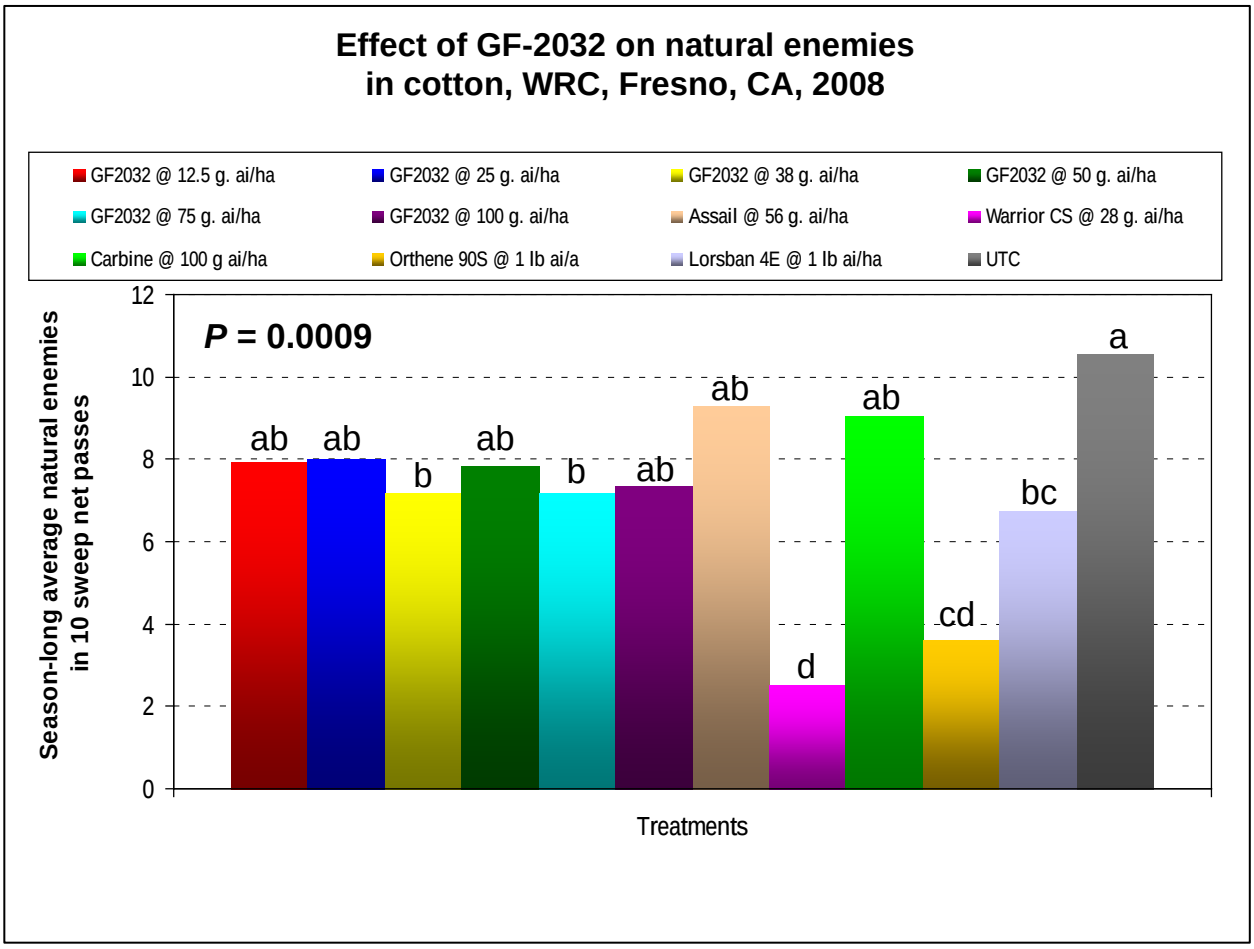

Figure 6. Impact of various rates of sulfoxaflor (GF2032) and other insecticides on natural enemy populations in cotton in California.

Although natural enemy populations provide little benefit for tarnished plant bug management, sprays with high rates of organophosphates and pyrethroids (usually applied as a tank mix) targeting tarnished plant bug reduce natural enemy populations and "flare" other pests such as twospotted spider mite, cotton aphid, or bollworm. A study conducted in Stoneville, MS in 2013 compared overall management programs. The treatments included cotton grown with all classes except neonicotinoids or sulfoxaflor, all classes except sulfoxaflor, and all available classes. Overall, one to two applications were needed for twospotted spider mite in the treatments where sulfoxaflor was not used (Figure 6). Additionally, the treatments that did not include sulfoxaflor each needed to be sprayed separately for cotton aphid (Figure 7). A portion of this is due to sulfoxaflor control of cotton aphids, but preservation of beneficial insects also contributed. In summary, the use of sulfoxaflor for tarnished plant bug management can reduce the number of

insecticide applications targeting other pests because of the lower toxicity to beneficial arthropods. Overall, yields and economic returns were greater where all classes of insecticides were included.

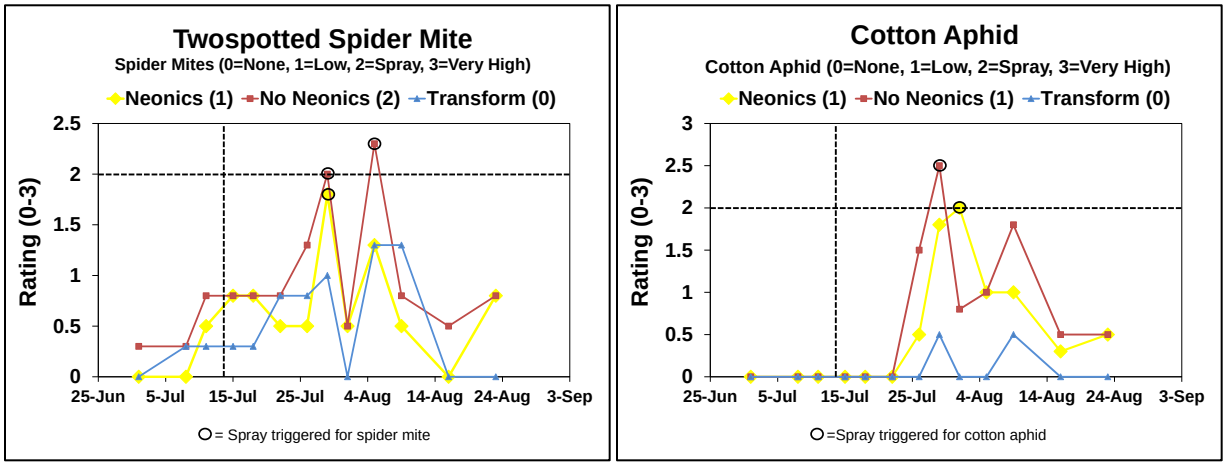

Figure 7. Impact of insecticide use programs for tarnished plant bug management on the number of insecticide sprays for twospotted spider mite and cotton aphid.

The tarnished plant bug IPM program has been important for increasing the profitability of cotton programs in Midsouth cotton. However, diversity in the available classes of insecticides available to manage tarnished plant bug is critical to make the overall IPM approach successful. In particular, insecticides that provide high levels of efficacy against tarnished plant bug that do not flare other pests provide the foundation for the overall cotton IPM program. Two insecticides have proven to be very important in this respect. Research throughout the Midsouth has shown that a single application of the insect growth regulator, novaluron, can provide long term benefits for tarnished plant bug management. However, novaluron does not control adult plant bugs and it consistently flares cotton aphids. As a result, sulfoxaflor is the ideal insecticide to use as one to two applications immediately following the novaluron application. Additionally, the registration of sulfoxaflor provided growers with a legitimate insecticide rotation strategy to make the tarnished plant bug IPM program successful.

The figure below (Figure 8) shows insecticide rotation strategies recommended by the Mississippi State University Extension Service for managing tarnished plant bug in cotton. North Carolina State University Extension Service insecticide rotation strategies are the same. The graph on the left shows the rotation strategy with sulfoxaflor available to producers and the graph on the right is without sulfoxaflor. It is plain to see from these graphs, that when sulfoxaflor is not available, growers do not have enough insecticides available to provide a legitimate rotation strategy to effectively implement a realistic IPM program. In fact, **many growers and consultants have been using bifenthrin synergized with acephate for multiple back-to-back sprays to achieve adequate control in North Carolina**. Since its registration in 2013, sulfoxaflor has become the most important insecticide providing a foundation for the

overall IPM program for tarnished plant bug in Mississippi. North Carolina needs sulfoxaflor to decrease the use of broad spectrum insecticides and to mitigate pyrethroid resistance.

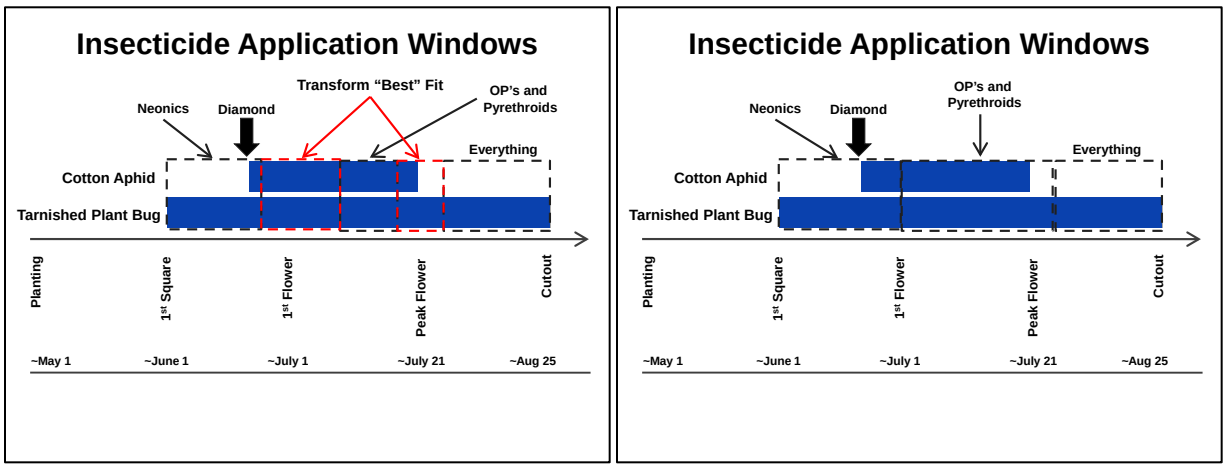

Figure 8. Insecticide rotation strategies to manage tarnished plant bug when sulfoxaflor is available (left) and when it is not available (right).

Similar comparisons are unavailable in North Carolina since the tarnished plant bug issue is relatively new compared to the Midsouth and because sulfoxaflor has not been available to growers for a number of years. However, tarnished plant bugs have a serious potential to cause yield loss for North Carolina growers and can be managed with either sulfoxaflor alone (Figure 9) or bifenthrin synergized with acephate (Figures 10, 11). As in the Midsouth, sulfoxaflor is needed in North Carolina as a rotational partner to avoid resistance and mitigate environmental hazard.

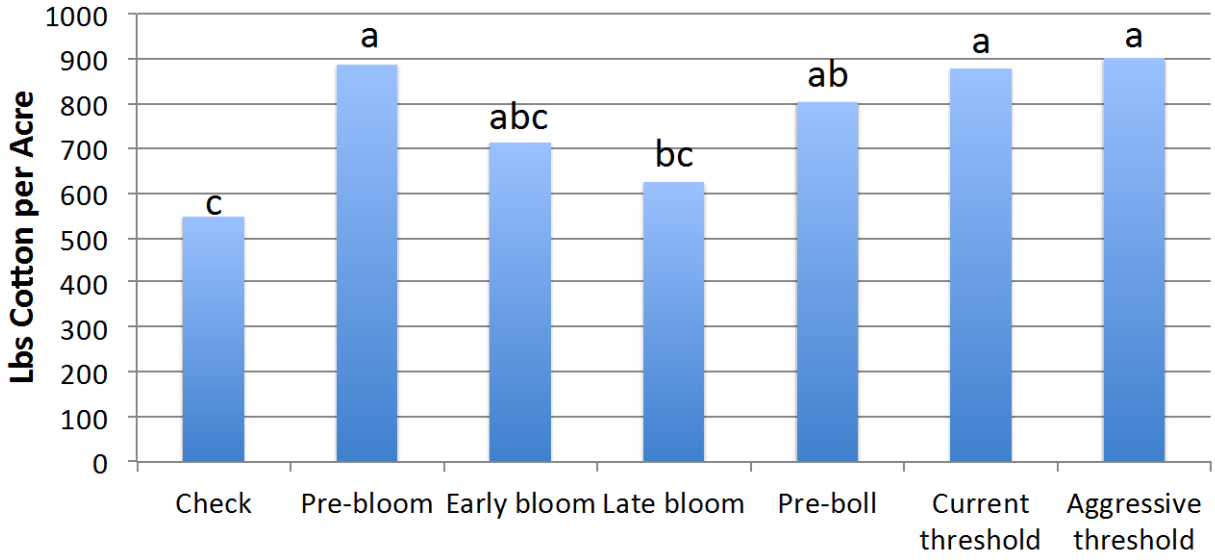

Figure 9. North Carolina 2016 threshold and spray timing trial. Sulfoxaflor used for all sprays, with six sprays of sulfoxaflor at current threshold. Yield loss difference between current threshold and check was 38%.

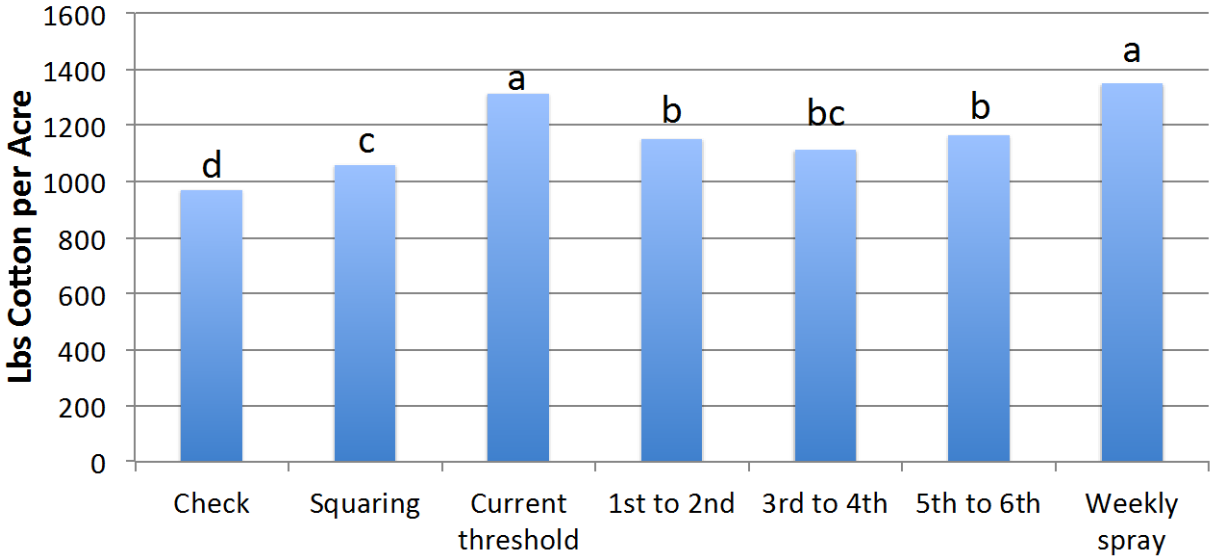

Figure 10. North Carolina 2017 threshold and spray timing trial on timely-planted cotton. Bifenthrin + acephate used for all sprays. Yield loss difference between current threshold and check was 26%.

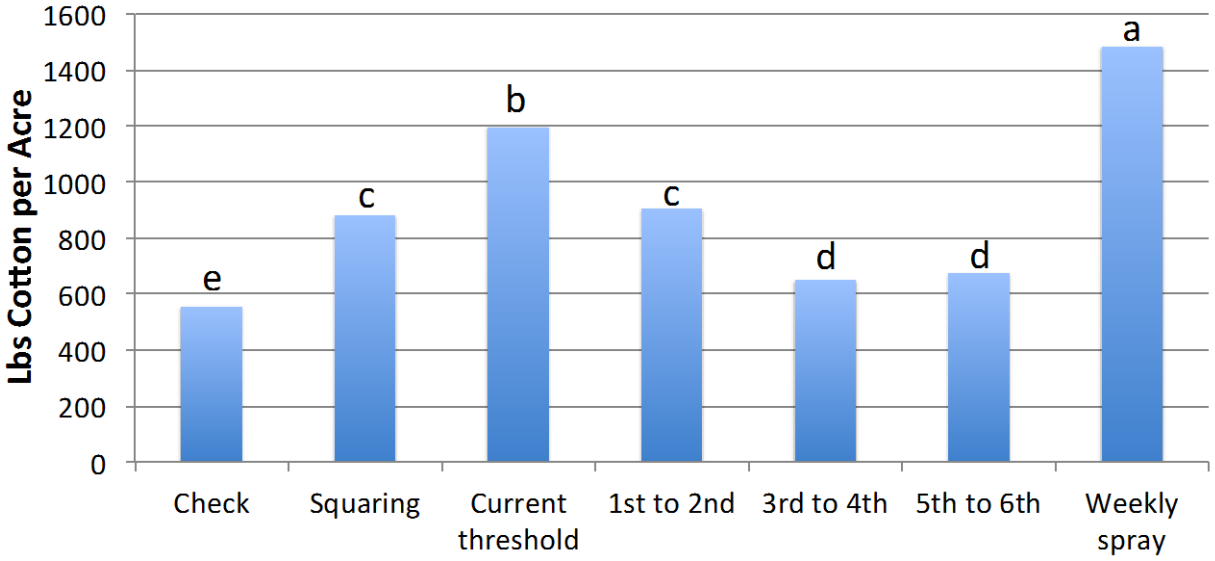

Figure 11. North Carolina 2017 threshold and spray timing trial on late-planted cotton. Bifenthrin + acephate used for all sprays. Yield loss difference between current threshold and check was 54%.

In conclusion, Figures 3, 4 and 10 demonstrate the efficacy of sulfoxaflor in North Carolina. Hence, all available data indicates that sulfoxaflor is an alternative product to the insecticides currently used to manage tarnished plant bug on cotton. It has proven to be an excellent tool for Midsouth cotton IPM programs by improving efficacy, reducing input costs, and increasing yields. This compound has a selective spectrum of activity, has not flared other pests, can be used as a rotational partner with other chemistries, and has demonstrated value against insecticide-resistant populations.

SECTION 166.20(a) 6: EXPECTED RESIDUE LEVELS IN FOOD

Acute Assessment

Food consumption information from the USDA 1994-1996 and 1998 Nationwide Continuing Surveys of Food Intake by Individuals (CSFII) and maximum residues from field trials rather than tolerance-level residue estimates were used. It was assumed that 100% of crops covered by the registration request are treated and maximum residue levels from field trials were used.

Drinking water. Two scenarios were modeled, use of sulfoxaflor on non-aquatic row and orchard crops and use of sulfoxaflor on watercress. For the non-aquatic crop scenario, based on the Pesticide Root Zone Model/Exposure Analysis Modeling System (PRZM/EXAMS) and Screening Concentration in Ground Water (SCI-GROW) models, the estimated drinking water concentrations (EDWCs) of sulfoxaflor for acute exposures are 26.4 ppb for surface water and 69.2 ppb for ground water. For chronic exposures, EDWCs are 13.5 ppb for surface water and 69.2 ppb for ground water. For chronic exposures for cancer assessments, EDWCs are 9.3 ppb for surface water and 69.2 ppb for ground water. For the watercress scenario, the EDWCs for surface water are 91.3 ppb after one application, 182.5 ppb after two applications and 273.8 ppb after three applications.

Dietary risk estimates using both sets of EDWCs are below levels of concern. The non-aquatic-crop EDWCs are more representative of the expected exposure profile for the majority of the population. Also, water concentration values are adjusted to take into account the source of the water; the relative amounts of parent sulfoxaflor, X11719474, and X11519540; and the relative liver toxicity of the metabolites as compared to the parent compound.
For acute dietary risk assessment of the general population, the groundwater EDWC is greater than the surface water EDWC and was used in the assessment. The residue profile in groundwater is 60.9 ppb X11719474 and 8.3 ppb X11519540 (totaling 69.2 ppb). Parent sulfoxaflor does not occur in groundwater. The regulatory toxicological endpoint is based on neurotoxicity.

For acute dietary risk assessment of females 13-49, the regulatory endpoint is attributable only to the parent compound; therefore, the surface water EDWC of 9.4 ppb was used for this assessment.

Tolerances of 0.2 ppm for sulfoxaflor on cottonseed, 0.35 ppm for cotton hulls, and 6.0 ppm for cotton gin byproducts has been established. There is no expectation of residues of sulfoxaflor and its metabolites in animal commodities as a result of the proposed use on cotton. Thus, animal feeding studies are not needed, and tolerances need not be established for meat, milk, poultry, and eggs.

Drinking water exposures are the driver in the dietary assessment accounting for 100% of the exposures. Exposures through food (cottonseed oil) are zero.

The acute dietary exposure from food and water to sulfoxaflor is 16% of the aPAD for children 1-2 years old and females 13-49 years old, the population groups receiving the greatest exposure.

Chronic Assessment

The same refinements as those used for the acute exposure assessment were used, with two exceptions: (1) average residue levels from crop field trials were used rather than maximum values and (2) average residues from feeding studies, rather than maximum values, were used to derive residue estimates for livestock commodities. It was assumed that 100% of crops are treated and average residue levels from field trials were used.

For chronic dietary risk assessment, the toxicological endpoint is liver effects, for which it is possible to account for the relative toxicities of X11719474 and X11519540 as compared to sulfoxaflor. The groundwater EDWC is greater than the surface water EDWC. The residue profile in groundwater is 60.9 ppb X11719474 and 8.3 ppb X11519540. Adjusting for the relative toxicity results in 18.3 ppb equivalents of X11719474 and 83 ppb X11519540 (totaling 101.3 ppb). The adjusted groundwater EDWC is greater than the surface water EDWC (9.3 ppb) and was used to assess the chronic dietary exposure scenario.

The maximum dietary residue intake via consumption of cottonseed oil commodities would be only a small portion of the RfD (<0.001%) and therefore, should not cause any additional risk to humans via chronic dietary exposure. Consumption of cottonseed oil by sensitive sub-populations such as children and non-nursing infants is essentially zero. Thus, the risk of these subpopulations to chronic dietary exposure to sulfoxaflor used on grain cottonseed oil would be insignificant.

The major contributor to the risk was water (100%). There was no contribution from cottonseed oil to the dietary exposure. All other populations under the chronic assessment show risk estimates that are below levels of concern.

Chronic exposure to sulfoxaflor from food and water is 18% of the cPAD for infants, the population group receiving the greatest exposure. There are no residential uses for sulfoxaflor.

Short-term risk. Because there is no short-term residential exposure and chronic dietary exposure has already been assessed, no further assessment of short-term risk is necessary, the chronic dietary risk assessment for evaluating short-term risk for sulfoxaflor is sufficient.

Intermediate-term risk. Intermediate-term risk is assessed based on intermediate-term residential exposure plus chronic dietary exposure. Because there is no residential exposure and chronic dietary exposure has already been assessed, no further assessment of intermediate-term risk is necessary.

Cumulative effects. Sulfoxaflor does not share a common mechanism of toxicity with any other substances, and does not produce a toxic metabolite produced by other substances. Thus, sulfoxaflor does not have a common mechanism of toxicity with other substances.

Cancer. A nonlinear RfD approach is appropriate for assessing cancer risk to sulfoxaflor. This approach will account for all chronic toxicity, including carcinogenicity that could result from exposure to sulfoxaflor. Chronic dietary risk estimates are below levels of concern; therefore, cancer risk is also below levels of concern.

There is a reasonable certainty that no harm will result to the general population, or to infants and children from aggregate exposure to sulfoxaflor as used in this emergency exemption request.

The content in the above Section 166.20(a)(6): "Expected Residues For Food Uses" was prepared by Michael Hare, Ph.D., Texas Department of Agriculture.

SECTION 166.20(a) 7: DISCUSSION OF RISK INFORMATION

Human Health Effects – Michael Hare, Ph.D.
Ecological Effects – David Villarreal, Ph.D.
Environmental Fate – David Villarreal, Ph.D.

Human Health

Toxicological Profile

Sulfoxaflor is a member of a new class of insecticides, the sulfoximines. It is an activator of the nicotinic acetylcholine receptor (nAChR) in insects and, to a lesser degree, mammals. The nervous system and liver are the target organs, resulting in developmental toxicity and hepatotoxicity.

Developmental toxicity was observed in rats only. Sulfoxaflor produced skeletal abnormalities likely resulting from skeletal muscle contraction due to activation of the skeletal muscle nAChR in utero. Contraction of the diaphragm, also related to skeletal muscle nAChR activation, prevented normal breathing in neonates and increased mortality. The skeletal abnormalities occurred at high doses while decreased neonatal survival occurred at slightly lower levels.

Sulfoxaflor and its major metabolites produced liver weight and enzyme changes, and tumors in subchronic, chronic and short-term studies. Hepatotoxicity occurred at lower doses in long-term studies compared to short-term studies.

Reproductive effects included an increase in Leydig cell tumors which were not treatment related due to the lack of dose response, the lack of statistical significance for the combined tumors, and the high background rates for this tumor type in F344 rats. The primary effects on male reproductive organs are secondary to the loss of normal testicular function due to the size of the Leydig Cell adenomas. The secondary effects to the male reproductive organs are also not treatment related. It appears that rats are uniquely sensitive to these developmental effects and are unlikely to be relevant to humans.

Clinical indications of neurotoxicity were observed at the highest dose tested in the acute neurotoxicity study in rats. Decreased motor activity was also observed in the mid- and high-dose groups. Since the neurotoxicity was observed only at a very high dose and many of the effects are

not consistent with the perturbation of the nicotinic receptor system, it is unlikely that these effects are due to activation of the nAChR.

Tumors have been observed in rat and mouse studies. In rats, there were significant increases in hepatocellular adenomas in the high-dose males. In mice, there were significant increases in hepatocellular adenomas and carcinomas in high dose males. In female mice, there was an increase in carcinomas at the high dose. Liver tumors in mice were treatment-related. Leydig cell tumors were also observed in the high-dose group of male rats, but were not related to treatment. There was also a significant increase in preputial gland tumors in male rats in the high-dose group. Given that the liver tumors are produced by a non-linear mechanism, the Leydig cell tumors were not treatment-related, and the preputial gland tumors only occurred at the high dose in one sex of one species, the evidence of carcinogenicity was weak.

Ecological Toxicity

Sulfoxaflor (N-[methyloxido[1-[6-(trifluoromethyl)-3-pyridinyl]ethyl]-lambda 4-sulfanylidene]) is a new variety of insecticide as a member of the sulfoxamine subclass of neonicotinoid insecticides. It is considered an agonist of the nicotinic acetylcholine receptor and exhibits excitatory responses including tremors, followed by paralysis and mortality in target insects. Sulfoxaflor consists of two diastereomers in a ratio of approximately 50:50 with each diastereomer consisting of two enantiomers. Sulfoxaflor is systemically distributed in plants when applied. The chemical acts through both contact action and ingestion and provides both rapid knockdown (symptoms are typically observed within 1-2 hours of application) and residual control (generally provides from 7 to 21 days of residual control). Incident reports submitted to EPA since approximately 1994 have been tracked via the Incident Data System. Over the 2012 growing season, a Section 18 emergency use was granted for application of sulfoxaflor to cotton in four states (MS, LA, AR, TN). No incident reports have been received in association with the use of sulfoxaflor in this situation.

Sulfoxaflor is classified as practically non-toxic on an acute exposure basis, with 96-h LC_{50} values of >400 mg a.i./L for all three freshwater fish species tested (bluegill, rainbow trout, and common carp). Mortality was 5% or less at the highest test treatments in each of these studies. Treatment-related sublethal effects included discoloration at the highest treatment concentration (100% of fish at 400 mg a.i./L for bluegill) and fish swimming on the bottom (1 fish at 400 mg a.i./L for rainbow trout). No other treatment-related sublethal effects were reported. For an estuarine/marine sheepshead minnow, sulfoxaflor was also practically non-toxic with an LC_{50} of 288 mg a.i./L. Sublethal effects included loss of equilibrium or lying on the bottom of aquaria at 200 and 400 mg a.i./L. The primary degradate of sulfoxaflor is also classified as practically non-toxic to rainbow trout on an acute exposure basis (96-h LC_{50} >500 mg a.i./L).

Adverse effects from chronic exposure to sulfoxaflor were examined with two fish species (fathead minnow and sheepshead minnow) during early life stage toxicity tests. For fathead minnow, the 30-d NOAEC is 5 mg a.i./L based on a 30% reduction in mean fish weight relative to controls at the next highest concentration (LOAEC=10 mg a.i./L). No statistically significant and/or treatment-related effects were reported for hatching success, fry survival and length. For sheepshead minnow, the 30-d NOAEC is 1.3 mg a.i./L based on a statistically significant reduction

in mean length (3% relative to controls) at 2.5 mg a.i./L. No statistically significant and/or treatment-related effects were reported for hatching success, fry survival and mean weight.

The acute toxicity of sulfoxaflor was evaluated for one freshwater invertebrate species, the water flea and two saltwater species (mysid shrimp and Eastern oyster). For the water flea, the 48-h EC_{50} is >400 mg a.i./L, the highest concentration tested. For Eastern oyster, new shell growth was significantly reduced at 120 mg a.i./L (75% reduction relative to control). The 96-h EC_{50} for shell growth is 93 mg a.i./L. No mortality occurred at any test concentration. Mysid shrimp are the most acutely sensitive invertebrate species tested with sulfoxaflor based on water column only exposures, with a 96-h LC_{50} of 0.67 mg a.i./L. The primary degradate of sulfoxaflor is also classified as practically non-toxic to the water flea (EC_{50} >240 mg a.i./L).

The chronic effects of sulfoxaflor to the water flea were determined in a semi-static system over a period of 21 days to nominal concentrations of 6.25, 12.5, 25, 50 and 100 mg a.i./L. Adult mortality, reproduction rate (number of young), length of the surviving adults, and days to first brood were used to determine the toxicity endpoints. No treatment-related effects on adult mortality or adult length were observed. The reproduction rate and days to first brood were significantly ($p<0.05$) different in the 100 mg a.i./L test group (40% reduction in mean number of offspring; 35% increase in time to first brood). No significant effects were observed on survival, growth or reproduction at the lower test concentrations. The 21-day NOAEC and LOAEC were determined to be 50 and 100 mg a.i./L, respectively.

The chronic effects of sulfoxaflor to mysid shrimp were determined in a flow-through system over a period of 28 days to nominal concentrations of 0.063, 0.13, 0.25, 0.50 and 1.0 mg a.i./L. Mortality of parent (F_0) and first generation (F_1), reproduction rate of F_0 (number of young), length of the surviving F_0 and F_1, and days to first brood by F_0 were used to determine the toxicity endpoints. Complete F_0 mortality (100%) was observed at the highest test concentration of 1.0 mg a.i./L within 7 days; no treatment-related effects on F_0/F_1 mortality, F_0 reproduction rate, or F_0/F_1 length were observed at the lower test concentrations. The 28-day NOAEC and LOAEC were determined to be 0.11 mg and 0.25 mg a.i./L, respectively.

Sulfoxaflor exhibited relatively low toxicity to aquatic non-vascular plants. The most sensitive aquatic nonvascular plant is the freshwater diatom with a 96-h EC_{50} of 81.2 mg a.i./L. Similarly, sulfoxaflor was not toxic to the freshwater vascular aquatic plant, *Lemna gibba*, up to the limit amount, as indicated by a 7-d EC_{50} for frond count, dry weight and growth rate of >100 mg a.i./L with no significant adverse effects on these endpoints observed at any treatment concentration.

Based on an acute oral LD_{50} of 676 mg a.i./kg bw for bobwhite quail, sulfoxaflor is considered slightly toxic to birds on an acute oral exposure basis. On a subacute, dietary exposure basis, sulfoxaflor is classified as practically nontoxic to birds, with 5-d LC_{50} values of >5620 mg/kg-diet for mallard ducks and bobwhite quail. The NOAEL from these studies is 5620 mg/kg-diet as no treatment related mortality of sublethal effects were observed at any treatment. Similarly, the primary degradate is classified as practically nontoxic to birds on an acute oral exposure basis with a LD_{50} of >2250 mg a.i./kg bw. In two chronic, avian reproductive toxicity studies, the 20-week NOAELs ranged from 200 mg/kg-diet (mallard, highest concentration tested) to 1000 mg/kg-diet

(bobwhite quail, highest concentration tested). No treatment-related adverse effects were observed at any test treatment in these studies.

For bees, sulfoxaflor is classified as very highly toxic with acute oral and contact LD_{50} values of 0.05 and 0.13 µg a.i./bee, respectively, for adult honey bees. For larvae, a 7-d oral LD_{50} of >0.2 µg a.i./bee was determined (45% mortality occurred at the highest treatment of 0.2 µg a.i./bee). The primary metabolite of sulfoxaflor is practically non-toxic to the honey bee. This lack of toxicity is consistent with the cyano-substituted neonicotinoids where similar cleavage of the cyanide group appears to eliminate their insecticidal activity. The acute oral toxicity of sulfoxaflor to adult bumble bees (*Bombus terrestris*) is similar to the honey bee; whereas its acute contact toxicity is about 20X less toxic for the bumble bee. Sulfoxaflor did not demonstrate substantial residual toxicity to honey bees exposed via treated and aged alfalfa (i.e., mortality was <15% at maximum application rates).

At the application rates used (3-67% of US maximum), the direct effects of sulfoxaflor on adult forager bee mortality, flight activity and the occurrence of behavioral abnormalities is relatively short-lived, lasting 3 days or less. Direct effects are considered those that result directly from interception of spray droplets or dermal contact with foliar residues. The direct effect of sulfoxaflor on these measures at the maximum application rate in the US is presently not known. When compared to control hives, the effect of sulfoxaflor on honey bee colony strength when applied at 3-32% of the US maximum proposed rate was not apparent in most cases. When compared to hives prior to pesticide application, sulfoxaflor applied to cotton foliage up to the maximum rate proposed in the US resulted in no discernible decline in mean colony strength by 17 days after the first application. Longer-term results were not available from this study nor were concurrent controls included. For managed bees, the primary exposure routes of concern include direct contact with spray droplets, dermal contact with foliar residues, and ingestion through consumption of contaminated pollen, nectar and associated processed food provisions. Exposure of hive bees via contaminated wax is also possible. Exposure of bees through contaminated drinking water is not expected to be nearly as important as exposure through direct contact or pollen and nectar.

In summary, sulfoxaflor is slightly toxic to practically non-toxic to fish and freshwater water aquatic invertebrates on an acute exposure basis. It is also practically non-toxic to aquatic plants (vascular and non-vascular). Sulfoxaflor is highly toxic to saltwater invertebrates on an acute exposure basis. The high toxicity of sulfoxaflor to mysid shrimp and benthic aquatic insects relative to the water flea is consistent with the toxicity profile of other insecticides with similar MOAs. For birds and mammals, sulfoxaflor is classified as moderately toxic to practically non-toxic on an acute exposure basis. The threshold for chronic toxicity (NOAEL) to birds is 200 ppm and that for mammals is 100 ppm in the diet. Sulfoxaflor did not exhibit deleterious effects to terrestrial plants at or above its proposed maximum application rates.

For bees, sulfoxaflor is classified as very highly toxic. However, if this insecticide is strictly used as directed on the Section 18 supplemental label, no significant adverse effects are expected to Louisiana wildlife. Of course, standard precautions to avoid drift and runoff to waterways of the state are warranted. As stated on the Section 3 label, risk to managed bees and native pollinators

from contact with pesticide spray or residues can be minimized when applications are made before 7 am or after 7 pm or when the temperature is below 55°F at the site of application.

Environmental Fate

Sulfoxaflor is a systemic insecticide which displays translaminar movement when applied to foliage. Movement of sulfoxaflor within the plant follows the direction of water transport within the plant (i.e., xylem mobile) as indicated by phosphor translocation studies in several plants. Sulfoxaflor is characterized by a water solubility ranging from 550 to 1,380 ppm. Sulfoxaflor has a low potential for volatilization from dry and wet surfaces (vapor pressure= 1.9×10^{-8} torr and Henry's Law constant= 1.2×10^{-11} atm m^3 $mole^{-1}$, respectively at 25 °C). Partitioning coefficient of sulfoxaflor from octanol to water (K_{ow} @ 20 C & pH 7= 6; Log K_{ow} = 0.802) suggests low potential for bioaccumulation. No fish bioconcentration study was provided due to the low K_{ow}, but sulfoxaflor is not expected to bioaccumulate in aquatic systems. Furthermore, sulfoxaflor is not expected to partition into the sediment due to low K_{oc} (7-74 mL/g).

Registrants tests indicate that hydrolysis, and both aqueous and soil photolysis are not expected to be important in sulfoxaflor dissipation in the natural environment. In a hydrolysis study, the parent was shown to be stable in acidic/neutral/alkaline sterilized aqueous buffered solutions (pH values of 5, 7 and 9). In addition, parent chemical as well as its major degradate, were shown to degrade relatively slowly by aqueous photolysis in sterile and natural pond water ($t^{½}$= 261 to >1,000 days). Furthermore, sulfoxaflor was stable to photolysis on soil surfaces. Sulfoxaflor is expected to biodegrade rapidly in aerobic soil (half-lives <1 day). Under aerobic aquatic conditions, biodegradation proceeded at a more moderate rate with half-lives ranging from 37 to 88 days. Under anaerobic soil conditions, the parent compound was metabolized with half-lives of 113 to 120 days while under anaerobic aquatic conditions the chemical was more persistent with half-lives of 103 to 382 days. In contrast to its short-lived parent, the major degradate is expected to be more persistent than its parent in aerobic/anaerobic aquatic systems and some aerobic soils. In other soils, less persistence is expected due to mineralization to CO_2 or the formation of other minor degradates.

In field studies, sulfoxaflor has shown similar vulnerability to aerobic bio-degradation in nine out of ten terrestrial field dissipation studies on bare-ground/cropped plots (half-lives were <2 days in nine cropped/bare soils in CA, FL, ND, ON and TX and was 8 days in one bare ground soil in TX). The chemical can be characterized by very high to high mobility (Kf_{oc} ranged from 11-72 mL g^{-1}). Rapid soil degradation is expected to limit chemical amounts that may potentially leach and contaminate ground water. Contamination of groundwater by sulfoxaflor will only be expected when excessive rain occurs within a short period (few days) of multiple applications in vulnerable sandy soils. Contamination of surface water by sulfoxaflor is expected to be mainly related to drift and very little due to run-off. This is because drifted sulfoxaflor that reaches aquatic systems is expected to persist while that reaching the soil system is expected to degrade quickly with slight chance for it to run-off.

When sulfoxaflor is applied foliar on growing crops it is intercepted by the crop canopy. Data presented above appear to indicate that sulfoxaflor enters the plant and is incorporated in the plant foliage with only limited degradation. It appears that this is the main source of the insecticide

sulfoxaflor that would kill sap sucking insects. This is because washed-off sulfoxaflor, that reaches the soil system, is expected to degrade.

In summary, sulfoxaflor has a low potential for volatilization from dry and wet surfaces. This chemical is characterized by a relatively higher water solubility. Partitioning coefficient of sulfoxaflor from octanol to water suggests low potential for bioaccumulation in aquatic organisms such as fish. Sulfoxaflor is resistant to hydrolysis and photolysis but transforms quickly in soils. In contrast, sulfoxaflor reaching aquatic systems by drift is expected to degrade rather slowly. Partitioning of sulfoxaflor to air is not expected to be important due to the low vapor pressure and Henry's Law constant for sulfoxaflor. Exposure in surface water results from the drifted parent compound, and only minor amounts are expected to run-off only when rainfall and/or irrigation immediately follow application. The use of this insecticide is not expected to adversely impact Louisiana ecosystems when used according to the Section 18 label. Of course, caution is needed to prevent exposure to water systems because of toxicity issues to aquatic invertebrates. As stated on the Section 3 label, this product should never be applied directly to water, to areas where surface water is present or to intertidal areas below the mean water mark. Also, the label includes the statement "Do not contaminate water when disposing of equipment rinsate."

The above content in Section 166.20(a)(7): Discussion of Risk Information was, for the most part, prepared by Michael Hare, Ph.D. (Human Health Effects), David Villarreal, Ph.D. (Ecological Effects), and David Villarreal, Ph.D. (Environmental Fate), all with the Texas Department of Agriculture. The parts of the above content in this section, with references to Mississippi, were prepared by MDAC-BPI.

Endangered and Threatened Species in North Carolina

No impacts are expected on endangered and threatened species by this very limited use of this insecticide as delineated in the Section 18 application. Sulfoxaflor demonstrates a very favorable ecotoxicity and fate profile as stated above and should not directly impact any protected mammal, fish, avian, or plant species. This product does adversely affect insects and aquatic invertebrates, especially bees, but the limited exposure to these species should not negatively affect endangered and threatened species in North Carolina when all applications label precautions are followed and preformed.

SECTION 166.20(a) 9: NOTIFICATION/SUPPORT OF REGISTRANT

Dow AgroScience has been notified of this agency's intent regarding this application and has offered a letter of support. They have also provided a copy of a label with the use directions for this use (although this use is dependent upon the approval of this section-18 by EPA).

Dow AgroSciences

Dow AgroSciences LLC
9330 Zionsvile Road
Indianapolis, IN 46163

dowagro.com

February 20, 2018

Dr. Dominic Reisig
Associate Professor & Extension Specialist
Department of Entomology
North Carolina State University
The Vernon James Research & Extension Center
207 Research Station Road
Plymouth, NC 27962

Re: Support letter for Transform™ WG Section 18 on cotton

Dear Dr. Reisig,

Per your request, this letter is to confirm that Dow AgroSciences supports the pursuit of a Section 18 emergency exemption for Transform WG to control plant bugs in cotton in the state of North Carolina. Transform WG has provided excellent efficacy against plant bugs in previous use under Section 18 exemptions, with no negative impacts on non-target insects. It also represents a new class of chemistry with a novel mode of action, and controls pests resistant to other classes of chemistry.

If you have questions, please do not hesitate to call me.

Sincerely,

Jamey Thomas, Ph.D.
US Regulatory Manager
Dow AgroSciences

cc: Tami Jones-Jefferson, DAS
Randy Huckaba, DAS

NC STATE RESTRICTED USE PESTICIDE: WHEN USED IN NORTH CAROLINA, APPLICATIONS CAN ONLY BE MADE BY LICENSED/CERTIFIED APPLICATORS OR BY PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY FOR THOSE USES COVERED BY THE LICENSED/CERTIFIED APPLICATORS CERTIFICATION.

Dow AgroSciences

Dow AgroSciences LLC 9330 Zionsville Road Indianapolis, IN 46268-1054 USA

Transform® WG

EPA Reg. No: 62719-625

For Control of Plant Bugs in Cotton

Section 18 Emergency Exemption
File symbol: XXXXXX

FOR DISTRIBUTION AND USE ONLY IN NORTH CAROLINA UNDER SECTION 18 EMERGENCY EXEMPTION.

This Section 18 Emergency Exemption is effective XXXXXX and expires XXXXXX.

- This labeling must be in the possession of the user at the time of application.
- It is in violation of federal law to use this product in a manner inconsistent with its labeling.
- Read the label affixed to the container for Transform® WG insecticide before applying. Carefully follow all precautionary statements and applicable use directions.
- Any adverse effects resulting from the use of Transform WG under this emergency exemption must be immediately reported to the North Carolina Department of Agriculture and Consumer Services

Environmental Hazards Statement: This product is highly toxic to bees exposed through contact during spraying and while spray droplets are still wet. This product may be toxic to bees exposed to treated foliage for up to 3 hours following application. Toxicity is reduced when spray droplets are dry. Risks to managed and native pollinators from contact with pesticide spray or residues can be minimized when applications are made before 7:00 a.m. or after 7:00 p.m. local time or when the temperature is below 55 degrees Fahrenheit (°F) at the site of application.

Directions for Use

Pests and Application Rates:

Pests	Transform WG (fl. oz./acre)
Plant bugs	1.5 fl. oz. – 2.25 fl. oz. (0.047 – 0.071 lb ai/acre)

Advisory Pollinator Statement: Notifying known beekeepers within 1 mile of the treatment area 48 hours before the product is applied will allow them to take additional steps to protect bees. If known apiaries are within one mile of cotton fields intended for treatment, applications should be made before 7:00 a.m. or after 7:00 p.m. local time during the flowering period. Growers are advised to refer and, when feasible, observe the cooperative standards outlined in the North Carolina Pollinator Protection Strategy for additional guidance and bee conservation stewardship efforts.

Application Timing: Treat in accordance with local economic thresholds. Consult your Dow AgroSciences representative, cooperative extension service, certified crop advisor or state agricultural experiment station for any additional local use recommendations for your area.

Application Rate: Use a higher rate in the rate range for heavy pest populations. Two applications may be required for optimum tarnished plant bug control under high pest pressure or heavy immigration of plant bugs from other crops.

Spray Drift Management: Applications are prohibited above wind speeds of 10 miles per hour (mph).

Restrictions:

- **Preharvest Interval:** Do not apply within 14 days of harvest.
- A restricted entry interval (REI) of 24 hours applies to all applications.
- **Minimum Treatment Interval:** Do not make applications less than 5 days apart.
- Do not make more than four applications per acre per year.
- Do not make more than two consecutive applications per crop.
- Do not apply more than a total of 8.5 fl. oz of Transform WG (0.266 lb ai of sulfoxaflor) per acre per year.

R396-205
Approved: __/__/__
Initial printing

SECTION 166.20(a) 10: ENFORCEMENT PROGRAM IN NORTH CAROLINA

Enforcement of regulations relating to an emergency exemption is the responsibility of the North Carolina Department of Agriculture and Consumer Services' Pesticide Section. Reports of beneficial effects and any adverse effects due to the use of this product under an emergency exemption that are obtained by the Cooperative Extension Service will be forwarded to the Pesticide Section. Applicators will be required to have a copy of the emergency exemption use directions in their possession when mixing and applying Transform WG Insecticide under this exemption. In North Carolina, when a pesticide is used under an emergency exemption, the pesticide is considered a Restricted Use Pesticide. Therefore, applications of Transform WG Insecticide under this exemption must be made by licensed/certified applicators or by those under the supervision of a licensed/certified applicator.

SECTION 166.20(a) 11: REPEAT USES

NCDA has never requested this application.

SECTION 166.20(b) 1: NAME OF THE PEST

Lygus lineolaris (Palisot de Beauvois), tarnished plant bug

SECTION 166.20(a) 11: DISCUSSION OF EVENTS OR CIRCUMSTANCES WHICH BROUGHT ABOUT THE EMERGENCY SITUATION

Prior to the mid-1990's, tarnished plant bugs were generally controlled by insecticides directed at other pests during the flowering period of cotton; therefore, economic damage from tarnished plant bugs during flowering was relatively uncommon. However, with 99.8% of North Carolina cotton now being planted to transgenic cotton expressing one or more toxins derived from *Bacillus thuringiensis* (Bt) (Williams 2017) and the eradication of the boll weevil, *Anthonomus grandis grandis* Boheman (Coleoptera: Curculionidae), many of the foliar applications for other pests during flowering have been eliminated.

While crop acreages have fluctuated from year-to-year, on average, corn and cotton acres have held relatively constant in North Carolina. The northeastern part of the state has always been a hotbed for tarnished plant bug, likely due to the diversity of crops, including vegetables and potato. Recently, clary sage acreage has increased, which could explain some of the expansion in both range and abundance. However, the main factors for the increase in tarnished plant bug pressure are still unknown. Regardless, due to higher populations that persist longer during the season, control costs and crop losses associated with tarnished plant bugs have increased dramatically. In North Carolina, a single application was directed to less than 5% of the acres prior to 2009, but skyrocketed to more than two applications on more than 75% of the acres by 2016 (Figure 4).

In addition, an increase in the frequency of chemical control strategies for this pest has intensified selection for resistance. Snodgrass and Gore (2007) reported resistance to a number

of OP's, carbamates, and pyrethroids in the Midsouth. Pyrethroid resistance is likely occurring in North Carolina, as well and producers are moving away from neonicotinoids due to their lack of efficacy during mid- and late-season. In addition, the actual seasonal AI/acre of neonicotinoids further restricts product availability. In order to obtain some level of population management, there has been an increase in rates to the highest dose labeled for a single application. Tarnished plant bug management in many North Carolina fields has degraded to a point where the only option to reduce yield impacts is co-application of products with different modes of action; sulfoxaflor has the potential to fill this gap. As referenced by Luckmann and Metcalf (1982) on the stages of crop protection, cotton producers and pest management practitioners are in crisis phase with tarnished plant bug. The subsequent step is that of reaching the disaster phase-potential in North Carolina cotton. This would result in a collapse of the existing pest management system for North Carolina cotton and losing the IPM based approach to plant bug management.

SECTION 166.20(a) 11: DISCUSSION OF ANTICIPATED RISKS TO ENDANGERED OR THREATENED SPECIES, BENEFICIAL ORGANISMS, OR THE ENVIRONMENT REMEDIED BY PROPOSED USE

As previously stated, it is not anticipated that there should be any anticipated risk to endangered or threated species, beneficial organisms, or the environment if all applications are made in accordance to the section 18 use directions.

- See Attachment A – Endangered and Threatened Species in North Carolina

SECTION 166.20(a) 11: DISCUSSION OF SIGNIFICANT ECONOMIC LOSS

As stated earlier, since the tarnished plant bug issue is a relatively new problem in cotton, comparisons are not available on yield loss in cotton due to tarnished plant bug before and after the elimination of sulfoxaflor. However, we believe that North Carolina growers are suffering significant economic loss without sufloxaflor, similar to that demonstrated in the Midsouth (MS Section 18 application). Furthermore, we have demonstrated a 38% yield loss to untreated cotton when sulfoxaflor was not used, compared to when sulfoxaflor was sprayed at threshold (Figure 9). Consequently, North Carolina cotton growers should be granted the same access to sulfoxaflor available to Midsouth cotton growers to prevent significant economic loss.

References used to support previous statements and Section 18 request:

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Attachment A
Endangered and Threatened Species Information

Anson County, North Carolina

Updated: 3-25-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Invertebrate:			
Schweinitz's sunflower	*Helianthus schweinitzii*	E	Current

Beaufort County, North Carolina

Updated: 3-9-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Kemp's (=Atlantic) ridley sea turtle	*Lepidochelys kempii*	E	Current
Red knot	*Calidris canutus rufa*	T	Current
Red wolf	*Canis rufus*	EXP	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
West Indian manatee	*Trichechus manatus*	E	Current
Vascular Plant:			
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current
Sensitive joint-vetch	*Aeschynomene virginica*	T	Current

Bertie County, North Carolina

Updated: 4-20-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Red knot	*Calidris canutus rufa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current

Bladen County, North Carolina

Updated: 4-20-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Wood stork	*Mycteria americana*	T	Current
Vascular Plant:			
American chaffseed	*Schwalbea americana*	E	Historic
Pondberry	*Lindera melissifolia*	E	Historic
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current

Brunswick County, North Carolina

Note: Marine Threatened and Endangered Species information can be found at the National Marine Fiseries Service (NMFS) Endangered and Threatened Species website
Updated: 02-15-2018

Critical Habitat Designations:

Piping plover - *Charadrius melodus* - See the Federal Register for a description of the primary constituent elements essential for the conservation of wintering piping plovers within the designated units. This document also contains a map and a description of each designated unit.
Federal Register Reference: July10, 2001, Federal Register, 66:36038?36136.
Loggerhead Sea Turtle - *Caretta caretta* - See the Federal Register for a description of the primary constituent elements essential for the conservation of nesting Loggerhead sea turtles within the designated units. This document also contains a map and a description of each designated unit.
Federal Register Reference: July10, 2014, Federal Register, 79:51264-51266

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
American eel	*Anguilla rostrata*	FSC	Current
Bachman's sparrow	*Aimophila aestivalis*	FSC	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Black-throated green warbler	*Dendroica virens waynei*	FSC	Current
Broadtail madtom	*Noturus* sp. cf. *leptacanthus*	FSC	Current
Carolina gopher frog	*Rana capito capito*	FSC	Current
Carolina pygmy sunfish	*Elassoma boehlkei*	FSC	Current
Eastern Henslow's sparrow	*Ammodramus henslowii susurrans*	FSC	Current
Eastern painted bunting	*Passerina ciris ciris*	FSC	Current
Green sea turtle	*Chelonia mydas*	T	Current
Hawksbill (=carey) sea turtle	*Eretmochelys imbricata*	E	Historic
Kemp's (=Atlantic) ridley sea turtle	*Lepidochelys kempii*	E	Current
Leatherback sea turtle	*Dermochelys coriacea*	E	Current

Loggerhead sea turtle	*Caretta caretta*	T	Current
Mimic glass lizard	*Ophisaurus mimicus*	FSC	Current
Northern pine snake	*Pituophis melanoleucus melanoleucus*	FSC	Current
Piping plover	*Charadrius melodus*	T	Current
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	FSC	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Red knot	*Calidris canutus rufa*	T	Current
Southern hognose snake	*Heterodon simus*	FSC	Current
Waccamaw silverside-Range by basin	*Menidia extensa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current
Wood stork	*Mycteria americana*	T	Current
Invertebrate:			
Buchholz's dart moth	*Agrotis buchholzi*	FSC	Current
Cape Fear threetooth	*Triodopsis soelneri*	FSC	Current
Carter's noctuid moth	*Spartiniphaga carterae*	FSC	Current
Eastern beard grass skipper	*Atrytone arogos arogos*	FSC	Obscure
Greenfield rams-horn	*Helisoma eucosmium*	FSC	Current
Loammi skipper	*Atrytonopsis loammi*	FSC	Historic
Magnificent rams-horn	*Planorbella magnifica*	FSC	Current
Rare skipper	*Problema bulenta*	FSC	Historic
Venus flytrap cutworm	*Hemipachnobia subporphyrea*	FSC	Current
Waccamaw spike	*Elliptio waccamawensis*	FSC	Current
Vascular Plant:			
Awned meadowbeauty	*Rhexia aristosa*	FSC	Historic
Carolina atamasco lily	*Zephyranthes simpsonii*	FSC	Current
Carolina bishopweed	*Ptilimnium ahlesii*	FSC	Current
Carolina bogmint	*Macbridea caroliniana*	FSC	Current
Carolina grass-of-parnassus	*Parnassia caroliniana*	FSC	Current
Carolina lead-plant	*Amorpha georgiana* var. *confusa*	FSC	Current
Coastal beaksedge	*Rhynchospora pleiantha*	FSC	Current
Coastal goldenrod	*Solidago villosicarpa*	FSC	Current
Cooley's meadowrue	*Thalictrum cooleyi*	E	Current
Dune blue curls	*Trichostema* sp. *1*	FSC	Current
Grassleaf arrowhead	*Sagittaria weatherbiana*	FSC	Historic
Harper's fimbristylis	*Fimbristylis perpusilla*	FSC	Current

Large-leaved Grass-of-Parnassus	*Parnassia grandifolia*	FSC	Current
Loose watermilfoil	*Myriophyllum laxum*	FSC	Current
Pickering's dawnflower	*Stylisma pickeringii* var. *pickeringii*	FSC	Historic
Pineland plantain	*Plantago sparsiflora*	FSC	Current
Pondspice	*Litsea aestivalis*	FSC	Current
Purple balduina	*Balduina atropurpurea*	FSC	Historic
Raven's boxseed	*Ludwigia ravenii*	FSC	Historic
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current
Savanna onion	*Allium* sp. *1*	FSC	Current
Seabeach amaranth	*Amaranthus pumilus*	T	Current
Spring-flowering goldenrod	*Solidago verna*	FSC	Current
Swamp forest beakrush	*Rhynchospora decurrens*	FSC	Current
Thorne's beakrush	*Rhynchospora thornei*	FSC	Current
Tough bumelia	*Sideroxylon tenax*	FSC	Current
Venus' fly-trap	*Dionaea muscipula*	FSC	Current
Wireleaf dropseed	*Sporobolus teretifolius sensu stricto*	FSC	Current
a quillwort	*Isoetes microvela*	FSC	Current
Nonvascular Plant:			
Savanna campylopus	*Campylopus carolinae*	FSC	Current

Cabarrus County, North Carolina

Updated: 4-2-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Northern long-eared bat	*Myotis septentrionalis*	T	Probable/Potential
Invertebrate:			
Carolina heelsplitter	*Lasmigona decorata*	E	Historic
Vascular Plant:			
Schweinitz's sunflower	*Helianthus schweinitzii*	E	Current

Camden County, North Carolina

Updated: 4-2-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Northern long-eared bat	*Myotis septentrionalis*	T	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Historic
Red knot	*Calidris canutus rufa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current

Carteret County, North Carolina

Updated: 3-25-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Green sea turtle	*Chelonia mydas*	T	Current
Hawksbill (=carey) sea turtle	*Eretmochelys imbricata*	E	Historic
Kemp's (=Atlantic) ridley sea turtle	*Lepidochelys kempii*	E	Current
Leatherback sea turtle	*Dermochelys coriacea*	E	Current
Loggerhead sea turtle	*Caretta caretta*	T	Current
Piping plover	*Charadrius melodus*	T	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Red knot	*Calidris canutus rufa*	T	Current
Roseate tern	*Sterna dougallii dougallii*	T	Current
Shortnose sturgeon	*Acipenser brevirostrum*	E	Current
West Indian manatee	*Trichechus manatus*	E	Current
Invertebrate:			
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current
Seabeach amaranth	*Amaranthus pumilus*	T	Current

Catawba County, North Carolina

Updated: 04-28-2017

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Southern Appalachian eastern woodrat	*Neotoma floridana haematoreia*	FSC	Current
Northern long-eared bat	*Myotis septentrionalis*	T	Probable/Potential
Invertebrate:			
Catawba crayfish ostracod	*Dactylocythere isabelae*	FSC	Current
Vascular Plant:			
Carolina Hemlock	*Tsuga caroliniana*	FSC	Current
Dwarf-flowered heartleaf	*Hexastylis naniflora*	T	Current
Schweinitz's sunflower	*Helianthus schweinitzii*	E	Current

Chowan County, North Carolina

Updated: 3-9-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red knot	*Calidris canutus rufa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current

Cleveland County, North Carolina

Updated: 04-28-2017

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Northern long-eared bat	*Myotis septentrionalis*	T	Probable/Potential
Invertebrate:			
Vascular Plant:			
Carolina Hemlock	*Tsuga caroliniana*	FSC	Current
Dwarf-flowered heartleaf	*Hexastylis naniflora*	T	Current
Torrey's Mountain-mint	*Pycnanthemum torrei*	FSC	Historic

Columbus County, North Carolina

Updated: 3-9-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Waccamaw silverside	*Menidia extensa*	T	Current
Wood stork	*Mycteria americana*	T	Current
Vascular Plant:			
Cooley's meadowrue	*Thalictrum cooleyi*	E	Current
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Historic

Craven County, North Carolina

Updated: 4-20-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Leatherback sea turtle	*Dermochelys coriacea*	E	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Red knot	*Calidris canutus rufa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current
Vascular Plant:			
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current
Sensitive joint-vetch	*Aeschynomene virginica*	T	Historic

Cumberland County, North Carolina

Updated: 012-26-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Invertebrate:			
Saint Francis' satyr butterfly	*Neonympha mitchellii francisci*	E	Current
Vascular Plant:			
American chaffseed	*Schwalbea americana*	E	Current
Michaux's sumac	*Rhus michauxii*	E	Current
Pondberry	*Lindera melissifolia*	E	Current
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current

Currituck County, North Carolina

Updated: 4-2-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Green sea turtle	*Chelonia mydas*	T	Current
Hawksbill (=carey) sea turtle	*Eretmochelys imbricata*	E	Historic
Kemp's (=Atlantic) ridley sea turtle	*Lepidochelys kempii*	E	Current
Leatherback sea turtle	*Dermochelys coriacea*	E	Current
Loggerhead sea turtle	*Caretta caretta*	T	Current
Northern long-eared bat	*Myotis septentrionalis*	T	Current
Piping plover	*Charadrius melodus*	T	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Historic
Red knot	*Calidris canutus rufa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current
Vascular Plant:			
Seabeach amaranth	*Amaranthus pumilus*	T	Current

Dare County, North Carolina

Updated: 4-20-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Green sea turtle	*Chelonia mydas*	T	Current
Hawksbill (=carey) sea turtle	*Eretmochelys imbricata*	E	Current
Kemp's (=Atlantic) ridley sea turtle	*Lepidochelys kempii*	E	Current
Leatherback sea turtle	*Dermochelys coriacea*	E	Current
Loggerhead sea turtle	*Caretta caretta*	T	Current
Piping plover	*Charadrius melodus*	T	Current
Red knot	*Calidris canutus rufa*	T	Current
Red wolf	*Canis rufus*	EXP	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Roseate tern	*Sterna dougallii dougallii*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current
Vascular Plant:			
Seabeach amaranth	*Amaranthus pumilus*	T	Current

Davidson County, North Carolina

Updated: 4-2-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Bog turtle	*Clemmys muhlenbergii*	T (S/A)	Probable/potential
Northern long-eared bat	*Myotis septentrionalis*	T	Current
Vascular Plant:			
Schweinitz's sunflower	*Helianthus schweinitzii*	E	Current

Duplin County, North Carolina

Updated: 09-22-2010

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current

Edgecombe County, North Carolina

Updated: 12-26-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Historic
Invertebrate:			
Tar River spinymussel	*Elliptio steinstansana*	E	Current

Franklin County, North Carolina

Updated: 12-27-2012

Common Name	Scientific name	Federal Status	Record Status
Invertebrate:			
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Current
Tar River spinymussel	*Elliptio steinstansana*	E	Current
Vascular Plant:			
Michaux's sumac	*Rhus michauxii*	E	Current

Gates County, North Carolina

Updated: 03-7-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
West Indian manatee	*Trichechus manatus*	E	Current

Greene County, North Carolina

Updated: 09-22-2010

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Red-cockaded woodpecker	*Picoides borealis*	E	Probable/potential

Halifax County, North Carolina

Updated: 3-25-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Historic
Invertebrate:			
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Current
Tar River spinymussel	*Elliptio steinstansana*	E	Current

Harnett County, North Carolina

Updated: 09-22-2010

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Cape Fear shiner	*Notropis mekistocholas*	E	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Vascular Plant:			
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current

Hertford County, North Carolina

Updated: 3-7-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Red-cockaded woodpecker	*Picoides borealis*	E	Current
West Indian manatee	*Trichechus manatus*	E	Current

Hoke County, North Carolina

Updated: 12-26-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Invertebrate:			
Saint Francis' satyr butterfly	*Neonympha mitchellii francisci*	E	Current
Vascular Plant:			
American chaffseed	*Schwalbea americana*	E	Current
Michaux's sumac	*Rhus michauxii*	E	Current
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current

Hyde County, North Carolina

Updated: 3-25-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Green sea turtle	*Chelonia mydas*	T	Obscure
Hawksbill (=carey) sea turtle	*Eretmochelys imbricata*	E	Current
Kemp's (=Atlantic) ridley sea turtle	*Lepidochelys kempii*	E	Current
Leatherback sea turtle	*Dermochelys coriacea*	E	Current
Loggerhead sea turtle	*Caretta caretta*	T	Current
Piping plover	*Charadrius melodus*	T	Current
Red knot	*Calidris canutus rufa*	T	Current
Red wolf	*Canis rufus*	EXP	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
West Indian manatee	*Trichechus manatus*	E	Current
Vascular Plant:			
Seabeach amaranth	*Amaranthus pumilus*	T	Current
Sensitive joint-vetch	*Aeschynomene virginica*	T	Current

Iredell County, North Carolina

Updated: 04-28-2017

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Allegheny woodrat	*Neotoma magister*	FSC	Current
Bog turtle	*Glyptemys muhlenbergii*	T (S/A)	Current
Northern long-eared bat	*Myotis septentrionalis*	T	Probable/Potential
Invertebrate:			
Vascular Plant:			
Dwarf-flowered heartleaf	*Hexastylis naniflora*	T	Current

Johnston County, North Carolina

Updated: 12-27-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Invertebrate:			
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Current
Tar River spinymussel	*Elliptio steinstansana*	E	Current
Vascular Plant:			
Michaux's sumac	*Rhus michauxii*	E	Historic

Jones County, North Carolina

Updated: 4-20-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current

Lee County, North Carolina

Updated: 4-2-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Cape Fear shiner	*Notropis mekistocholas*	E	Current
Northern long-eared bat	*Myotis septentrionalis*	T	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Historic
Vascular Plant:			
Harperella	*Ptilimnium nodosum*	E	Historic

Lenoir County, North Carolina

Updated: 12-26-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Historic
Vascular Plant:			
Sensitive joint-vetch	*Aeschynomene virginica*	T	Historic

Lincoln County, North Carolina

Updated: 05-04-2017

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Northern long-eared bat	*Myotis septentrionalis*	T	Probable/Potential
Invertebrate:			
Vascular Plant:			
Dwarf-flowered heartleaf	*Hexastylis naniflora*	T	Current
Georgia aster	*Symphyotrichum georgianum*	C	Current
Michaux's sumac	*Rhus michauxii*	E	Historic

Martin County, North Carolina

Updated: 03-09-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current

Montgomery County, North Carolina

Updated: 12-26-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Vascular Plant:			
Schweinitz's sunflower	*Helianthus schweinitzii*	E	Current
Smooth coneflower	*Echinacea laevigata*	E	Historic

Moore County, North Carolina

Updated: 12-26-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Cape Fear shiner	*Notropis mekistocholas*	E	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Vascular Plant:			
American chaffseed	*Schwalbea americana*	E	Current
Michaux's sumac	*Rhus michauxii*	E	Current

Nash County, North Carolina

Updated: 12-27-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Historic
Invertebrate:			
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Current
Tar River spinymussel	*Elliptio steinstansana*	E	Current

Northampton County, North Carolina

Updated: 03-09-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Historic

Onslow County, North Carolina

Updated: 3-25-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Green sea turtle	*Chelonia mydas*	T	Current
Hawksbill (=carey) sea turtle	*Eretmochelys imbricata*	E	Historic
Kemp's (=Atlantic) ridley sea turtle	*Lepidochelys kempii*	E	Current
Leatherback sea turtle	*Dermochelys coriacea*	E	Current
Loggerhead sea turtle	*Caretta caretta*	T	Current
Piping plover	*Charadrius melodus*	T	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Red knot	*Calidris canutus rufa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current
Vascular Plant:			
Cooley's meadowrue	*Thalictrum cooleyi*	E	Current
Golden sedge	*Carex lutea*	E	Current
Pondberry	*Lindera melissifolia*	E	Current
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current
Seabeach amaranth	*Amaranthus pumilus*	T	Current

Pamlico County, North Carolina

Updated: 3-9-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Kemp's (=Atlantic) ridley sea turtle	*Lepidochelys kempii*	E	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Red knot	*Calidris canutus rufa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Historic
Vascular Plant:			
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current

Pasquotank County, North Carolina

Updated: 3-9-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red knot	*Calidris canutus rufa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current

Pender County, North Carolina

Updated: 3-25-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Green sea turtle	*Chelonia mydas*	T	Current
Hawksbill (=carey) sea turtle	*Eretmochelys imbricata*	E	Historic
Kemp's (=Atlantic) ridley sea turtle	*Lepidochelys kempii*	E	Current
Leatherback sea turtle	*Dermochelys coriacea*	E	Current
Loggerhead sea turtle	*Caretta caretta*	T	Current
Piping plover	*Charadrius melodus*	T	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Red knot	*Calidris canutus rufa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current
Vascular Plant:			
American chaffseed	*Schwalbea americana*	E	Historic
Cooley's meadowrue	*Thalictrum cooleyi*	E	Current
Golden sedge	*Carex lutea*	E	Current
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current
Seabeach amaranth	*Amaranthus pumilus*	T	Current

Perquimans County, North Carolina

Updated: 3-9-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red knot	*Calidris canutus rufa*	T	Current
West Indian manatee	*Trichechus manatus*	E	Current

Pitt County, North Carolina

Updated: 3-9-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Historic
West Indian manatee	*Trichechus manatus*	E	Current
Invertebrate:			
Tar River spinymussel	*Elliptio steinstansana*	E	Historic

Richmond County, North Carolina

Updated: 3-9-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Vascular Plant:			
Michaux's sumac	*Rhus michauxii*	E	Current
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current

Robeson County, North Carolina

Updated: 12-03-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Vascular Plant:			
Michaux's sumac	*Rhus michauxii*	E	Current

Rowan County, North Carolina

Updated: 4-2-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Northern long-eared bat	*Myotis septentrionalis*	T	Probable/Potential
Vascular Plant:			
Schweinitz's sunflower	*Helianthus schweinitzii*	E	Current

Rutherford County, North Carolina

Updated: 7-24-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bog turtle	*Glyptemys muhlenbergii*	T (S/A)	Current
Cerulean warbler	*Dendroica cerulea*	FSC	Current
Eastern small-footed bat	*Myotis leibii*	FSC	Current
Green salamander	*Aneides aeneus*	FSC	Current
Indiana bat	*Myotis sodalis*	E	Current
Northern long-eared bat	*Myotis septentrionalis*	T	Current
Northern pine snake	*Pituophis melanoleucus melanoleucus*	FSC	Obscure
Southern Appalachian eastern woodrat	*Neotoma floridana haematoreia*	FSC	Current
Invertebrate:			
Vascular Plant:			
Butternut	*Juglans cinerea*	FSC	Current
Carolina Hemlock	*Tsuga caroliniana*	FSC	Current
Divided-leaf Ragwort	*Packera millefolium*	FSC	Current
Dwarf-flowered heartleaf	*Hexastylis naniflora*	T	Current
Granite dome goldenrod	*Solidago simulans*	FSC	Current
Small whorled pogonia	*Isotria medeoloides*	T	Current
White irisette	*Sisyrinchium dichotomum*	E	Current
Nonvascular Plant:			
Appalachian Pocket Moss	*Fissidens appalachensis*	FSC	Current
Roundleaf liverwort	*Cephaloziella obtusilobula*	FSC	Current
Lichen:			
Rock gnome lichen	*Gymnoderma lineare*	E	Current
Worthy Shield Lichen	*Canoparmelia amabilis*	FSC	Current

Sampson County, North Carolina

Updated: 7-2-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Historic
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Wood stork	*Mycteria americana*	T	Current
Vascular Plant:			
Pondberry	*Lindera melissifolia*	E	Current

Scotland County, North Carolina

Updated: 12-26-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Vascular Plant:			
American chaffseed	*Schwalbea americana*	E	Current
Canby's dropwort	*Oxypolis canbyi*	E	Current
Michaux's sumac	*Rhus michauxii*	E	Current
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current

Stanly County, North Carolina

Updated: 4-2-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Northern long-eared bat	*Myotis septentrionalis*	T	Probable/Potential
Vascular Plant:			
Schweinitz's sunflower	*Helianthus schweinitzii*	E	Current

Tyrrell County, North Carolina

Updated: 3-9-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red knot	*Calidris canutus rufa*	T	Current
Red wolf	*Canis rufus*	EXP	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
West Indian manatee	*Trichechus manatus*	E	Current

Union County, North Carolina

Updated: 03-25-2015

Common Name	Scientific name	Federal Status	Record Status
Invertebrate:			
Carolina heelsplitter	*Lasmigona decorata*	E	Current
Vascular Plant:			
Michaux's sumac	*Rhus michauxii*	E	Current
Schweinitz's sunflower	*Helianthus schweinitzii*	E	Current

Wake County, North Carolina

Updated: 4-2-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Northern long-eared bat	*Myotis septentrionalis*	T	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current
Invertebrate:			
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Current
Vascular Plant:			
Michaux's sumac	*Rhus michauxii*	E	Current

Warren County, North Carolina

Updated: 12-27-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Invertebrate:			
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Current
Tar River spinymussel	*Elliptio steinstansana*	E	Current

Washington County, North Carolina

Updated: 4-2-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
American alligator	*Alligator mississippiensis*	T (S/A)	Current
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Northern long-eared bat	*Myotis septentrionalis*	T	Current
Red knot	*Calidris canutus rufa*	T	Current
Red wolf	*Canis rufus*	EXP	Current
West Indian manatee	*Trichechus manatus*	E	Current

Wayne County, North Carolina

Updated: 03-25-2015

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Current

Wilson County, North Carolina

Updated: 12-27-2012

Common Name	Scientific name	Federal Status	Record Status
Vertebrate:			
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current
Red-cockaded woodpecker	*Picoides borealis*	E	Historic
Invertebrate:			
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Current
Vascular Plant:			
Michaux's sumac	*Rhus michauxii*	E	Historic